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## Revicki's Response to Dayal

We appreciate the interest Dayal showed in the results of our study. Body mass indices (BMIs) are effect, weight-corrected-for-height indices. The assumption is that the BMIs provide an improved estimate of adiposity over weight alone. Commonly proposed criteria for a good BMI are: it should have a high correlation with measures of adiposity and a low correlation with height.[1-3] The different BMIs have been formulated to statistically adjust weight for height. More direct laboratory measures of adiposity are usually not available in large epidemiologic studies.

We found that four BMIs (W/H, $W/H^2$, $W/H^3$, $W/H^p$) were highly intercorrelated (r = .91–.99) and that the Quetelet ($W/H^2$) index and Benn ($W/H^p$) index were not significantly correlated with height in this sample.[4] These findings are supported by a number of different investigators using different populations.[1,3] Of more importance is the relationship between the BMIs and laboratory measures of body fat. In our study, the BMIs are correlated .69–.71 with hydrostatic measures. Therefore, it was our conclusion that the BMIs are equally acceptable estimates of adiposity, based on the correlations with hydrostatic and skinfold measures. If it is important that BMIs are unbiased by height, as some investigators suggest, then the Benn index and the Quetelet index may be the indices of choice based on the results of our study.

The high intercorrelation among the BMIs are due to the specific mathematical function used to generate the BMIs (e.g., weight/height$^x$, where x = 1,2,3 or p). Depending on the exact relationship between weight and height in the sample, it can be demonstrated that as the exponent (x) increases, the correlation between the BMI and weight tends to decrease and the correlation with height tends to become more negative. Because of the nature of this mathematical function, weight will normally have a positive correlation with the BMIs. The correlation between height and the BMIs, in any particular sample, varies in magnitude and sign depending on the value of the exponent used in the denominator.

We agree with Dayal that BMIs are useful as surrogate measures of body fat in epidemiologic studies. However, there is some question whether the different BMIs are interchangable measures of obesity. It is logical to conclude that the most useful BMI may be the one that correlates least with height, so that it is not confounded by height in comparison studies.[5] Lee and Kolonel[5,6] have demonstrated that two highly correlated BMIs do not necessarily produce similar statistical results in a comparison study. Therefore, the BMIs may not be interchangeable in all analytic situations.

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## Cesarean Rate Increases in 1985

The cesarean delivery rate in the United States has risen from 16.5 cesareans per 100 deliveries in 1980[1] to 22.7 in 1985. Applied to the provisional number of births for 1985 from vital registration data (3,749,000),[2] an estimated 851,000 live-born infants were delivered by cesarean in 1985. In 1984, the cesarean rate was 21.1.[3] A two-decade pattern of increases has been observed since 1965, when the rate was 4.5.[1] These rate increases have been fairly uniform for women of all ages and marital statuses. Similar increases have been observed in hospitals of all sizes, hospital ownership, and in the four geographic regions of the country.[4,5]

In 1985, the C-section rate rose with age; minor regional variations which were more apparent in earlier years have leveled out, and hospitals with fewer than 100 beds had a somewhat lower C-section rate than larger hospitals (a pattern observed in previous years); there were no statistically significant differences in the rates by type of hospital ownership (Table 1).

The National Hospital Discharge Survey (NHDS) conducted by the National Center for Health Statistics (NCHS) has been used to monitor these trends. Medical information from the 1985 NHDS was abstracted from the face sheets of about 200,000 medical records sampled for inpatient discharges from a representative national sample of over 400 non-federal general and special short-stay hospitals; data were coded according to ICD-9-CM. The 1986 data are based on the approximately 10 per cent of the NHDS sample abstracts, 18,044 women discharged after delivery; they do not include therapeutic abortions.[6]

The obstetrical norm of "once a C-section, always a C-section" remains intact; 93.4 per cent of the 1985 deliveries by women who had previously delivered by cesarean were again cesarean, despite 1982 "Guideline for Vaginal Delivery after a Cesarean Childbirth"[7] issued by the American College of Obstetricians and Gynecologists, and relaxed guidelines for vaginal birth after cesarean (VBAC) and trial of labor issued once again in 1985.[8]

One reason for the increase in the cesarean rate involves a major change in the obstetrical management of breech presentations. In 1970, only 14.8 per cent of breech presentations were delivered by cesarean,[9] increasing in 1980 to 67.2 per cent,[10] and in 1985 to 80.4 per cent.

The average length of stay (LOS) for mothers with cesarean delivery is 5.2 days (5.3 days for primary cesareans and 5.0 days for repeat cesareans), almost double the 2.7 days for mothers with vaginal deliveries. LOS for VBAC deliveries is 2.8 days, compared with 2.7 days for other vaginal deliveries. Because VBAC does not noticeably increase LOS, this suggests that women with VBAC deliveries are not experiencing more complications than other women who deliver vaginally.

If the revised guidelines for trial of labor and VBAC are more widely implemented, and if insurers include cesareans in medical necessity program reviews because of concerns over costs,[11] a rapid shift may occur in the relative proportion of deliveries which

**TABLE 1—Cesarean Section Rates (per 100 deliveries) for Non-federal Short-stay Hospitals by Region of Residence, Mother's Age, and Hospital Size and Ownership, United States, 1985**

| | United States | Region of Residence | | | |
|---|---|---|---|---|---|
| | | Northeast | Midwest | South | West |
| Total | 22.7 | 22.8 | 22.0 | 23.5 | 22.4 |
| Age of Mother (years) | | | | | |
| < 20 | 16.1 | 15.5 | 18.5 | 16.0 | 14.0 |
| 20–24 | 21.2 | 20.7 | 20.4 | 22.6 | 20.1 |
| 25–29 | 22.9 | 23.2 | 22.3 | 23.4 | 22.6 |
| 30–34 | 26.6 | 24.8 | 23.2 | 30.7 | 26.7 |
| 35 ≧ | 30.7 | 30.9 | 31.2 | 30.6 | 30.2 |
| Hospital Size (beds) | | | | | |
| < 100 | 18.1 | 21.3 | 18.6 | 15.9 | 19.0 |
| 100–499 | 23.3 | 22.2 | 21.9 | 24.6 | 23.6 |
| 500 ≧ | 23.9 | 24.9 | 23.1 | 24.7 | 21.8 |
| Hospital Ownership | | | | | |
| Proprietary | 21.6 | 21.3 | 21.4 | 23.2 | 20.4 |
| Government | 21.0 | 20.3 | 22.1 | 21.1 | 20.8 |
| Voluntary nonprofit | 23.5 | 23.0 | 22.1 | 24.9 | 23.6 |

are repeat cesareans and VBACs. Still, about 65 per cent of all cesareans are primary cesareans, and no new medical guidelines appear to have surfaced to affect that component of the cesarean rate.

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## Economic Development, Political-Economic System and PQL

The study of Cereseto and Waitzkin on the relationship between economic-political systems and the physical quality of life is an interesting investigation, especially in light of the fact that health care is increasingly becoming a global issue. Altering the classification used may either improve the results and/or alter their conclusion that "in the less developed countries, the differences in PQL between the capitalist and socialist systems are profound."[1]

Grouping countries into capitalist and socialist blocks based on whether they are market or centrally planned economies is misleading and inadequate for measuring the economic impact on quality of life. Although countries such as Bhutan, Bangladesh, and Nepal are non-communist countries, they cannot be classified as truly capitalist countries because the major portion of their GNP is generated by government-owned and planned industries. To that extent, they are centrally planned economies and not market-oriented economies.

The correct measurement unit is the degree to which the government interferes with the market system, rather than the outward appearance of the economic system. If the above definition is used, more than half of those countries classified into the capitalist group by the authors would be reclassified into centrally planned economies with potentially significant impact on the authors' findings.

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## Response from Cereseto and Waitzkin

We appreciate Dr. Zilberg's and Dr. Kwon's thoughtful criticisms of our study. The analysis of variance and multiple regression procedures in our study showed that both economic development (as measured by gross national product per capita, GNP/c) and political-economic system are strong predictors of physical quality of life (PQL). It is strange that Zilberg accepts the evidence of a strong statistical correlation between per capita national income and PQL, but that he does not accept the evidence of a strong statistical correlation between political-economic system and PQL.

We compared capitalist and socialist groups of countries at similar income levels in three categories: low-income, lower-middle-income, and upper-middle-income. Socialist countries showed more favorable PQL outcomes at each level. Zilberg finds faults with each of the three comparisons of capitalist and socialist countries, but his arguments do not substantiate his criticism. In the low-income category, the mean GNP/c for the capitalist group of countries was $299; the GNP/c of China, the only socialist country in this category, was $300, almost identical. Zilberg complains that 30 per cent of the low-income capitalist countries had incomes lower than that of China. This observation means that 70 per cent of the low-income capitalist countries had incomes higher than that of China—which Zilberg neglects to point out. Thus the capitalist countries should be superior to socialist China in PQL, but China's PQL scores are much higher than the mean PQL scores of the low-income capitalist countries.